

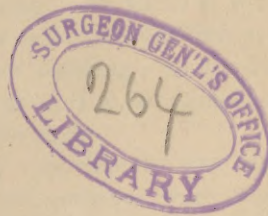
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NOTE ON THE ACTION OF LOBELINA ON THE
CIRCULATION.

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NOTE ON THE ACTION OF LOBELINA ON THE CIRCULATION.

BY J. OTT, M. D., OF EASTON, PA.

THE lobelina was prepared by Messrs. Hance Bros. and White, of Philadelphia, after the method of Proctor. It was a dark, oily liquid, of considerable consistency, tobacco-like taste and odor, with a specific gravity heavier than that of water. The strength of the solution used was four fifths of a drop of lobelina to one cubic centimetre, with a few drops of acetic acid, care being taken that the solution was absolutely neutral. The color of the solution was a rich, bright yellow, the resin adhering to the sides of the bottle and the stirring-rod. As the quantity was extremely small, only one toxic experiment was made, which is as follows: A frog, at 11.45 A. M., received two fifths of a drop of lobelina. At 11.49 A. M., sensibility was diminished; the frog could be easily taken up in the hand. At 11.51 A. M., respirations diminishing in number; motor power of anterior extremities less. At 11.53 A. M., sensibility considerably diminished; pupil contracting. At 11.57 A. M., loss of motor power in the posterior extremities; frog hops when pinched. At 12 M., unable to make coördinate movements; respiratory action now and then; seems dozing. At 12.13 P. M., heart laid bare; it beats sixty per minute; feeble reflex excitability, as evidenced by slight twitches of the extremities on pinching; no respiration. At 4 P. M., reflex action about the same as at 1 P. M.; pupil contracted. Next morning, frog had completely recovered.

Circulation.—The number of my experiments was six, and all were made on rabbits. The pulse and pressure were registered by Ludwig's manometer on a kymographion presenting a continuous roll of paper. The time was noted by an electro-magnetic apparatus, the current being broken by a pendulum beating seconds. The time of the injection was also recorded, as well as the period of the irritation of the nerves, by a special contrivance. The carotid artery was used for observation, and into the left jugular or one of its branches had been bound a canula, into which the nozzle of a syringe accurately fitted, and

through which the poison was injected towards the heart. Artificial respiration was kept up by an apparatus on the principle of Sprengel's blower.

Experiment I. — Rabbit. The pulse and pressure are always given for thirty seconds; pressure in millimetres of mercury.

Time.	Pulse.	Pressure.
	129	110
A. M. 11 20	Lobelina, four fifths of a drop.	
11 21	65	64-130 Struggling.
11 21 30	142	120
11 22	114	150
11 27	110	140
11 31 15	114	120
11 32 45	114	120
11 34 9	Vagi cut.	
	167	152
	Lobelina, four fifths of a drop.	
11 34 39	182	156 Struggling.
11 35 30	125	80
11 36	109	46

As the injection of the poison caused struggling, which would prevent an accurate study of the action on the circulation, I used curare to paralyze the motor nerves.

Experiment II. — Rabbit curarized.

Time.	Pulse.	Pressure.
	110	110
P. M. 1 50	Lobelina, four fifths of a drop.	
1 50 30	74	100-110
1 51	103	158
1 51 30	70	130
1 52	55	100
1 54	81	94
	111	104
	Vagus irritated.	
1 56 30	97	96
2 2	144	118
2 3	Vagi cut.	
2 18 40	166	116
	Lobelina, four fifths of a drop.	
2 19 15	150	110-138
2 19 45		126
2 20 15		120

As section of the pneumogastrics removes all inhibitory action of central character, and as the action of lobelina on the pressure is the same as before the section, I infer that the poison does not act on the

central inhibitory apparatus. To set aside the peripheral inhibition of the vagi, the poisons atropine and nicotine are used; the latter causing more complete and extensive paralysis of the inhibitory ganglia seated in the heart than the former.

Experiment III.—Rabbit, curarized; nicotine; vagi completely paralyzed, as tested by strong currents.

Time.	Pulse.	Pressure.
	126	40
	Lobelina, four fifths of a drop.	
P. M. 2 15	106	44-34
2 15 30	92	30
2 16	90	26
2 17 30	121	25
2 21	130	27
2 21 30	144	30

Experiment IV.—Rabbit; vagi paralyzed by atropia; curarized.

Time.	Pulse.	Pressure.
	125	82
	Lobelina, four fifths of a drop.	
A. M. 10 50	91	80-190
10 50 30	77	120
10 51	90	104
10 53	96	100
10 57 30	88	110
11 9	115	96
11 10 30	116	100
11 13 30	Nicotine injected.	
11 14	149	140
11 26 30	126	106
	Lobelina, four fifths of a drop.	
11 27 9	88	84- 96
11 27 39	90	96
11 28 9	91	96
11 29 30	105	100
11 30 30	108	100
11 37	107	104
11 44 40	104	106

It is seen that, after the paralysis by atropine, the pressure rises as before, but that after the exhibition of nicotine no rise of any importance takes place. To study the action of lobelina on the heart and its contained ganglia, it is necessary to divide the pneumogastrics, sympathetics, and depressors of Ludwig in the neck, and to sever the cord (which contains the accelerator and vaso-motor fibres) between the atlas and the occiput.

Experiment V. — Rabbit, curarized; all cardiac nerves in the neck are cut; cord cut between the occiput and atlas, verified by post-mortem; bleeding staunched by bovista.

Time.	Pulse.	Pressure.
	130	25
	Lobelina, four fifths of a drop.	
A. M. 10 40	106	30
10 40 30	91	40
10 45 30	124	30
10 46	140	32

The unimportant rise of pressure when lobelina is acting on a nicotinized heart, the statement of Rosenthal¹ that nicotine finally paralyzes the vessels, and the nearly double rise of pressure when the action of the vaso-motor centre is removed, caused a suspicion that there was an action on the peripheral vaso-motor apparatus. Happily, there is possessed in nitrite of amyl a poison which has the power to paralyze the peripheral action of the vaso-motor system, as has been proved by Brunton² and H. C. Wood.³ In accordance with this fact, the following experiment was made.

Experiment VI. — Rabbit, curarized; nitrite of amyl administered by means of a flask whose stopper was so arranged that by turning it a quarter of a circle, one could at pleasure admit or exclude the amyl from the inhaled air.

Time.	Pulse.	Pressure.
	159	28 ⁴
	Lobelina, four fifths of a drop.	
A. M. 10 30	147	28
10 30 30	154	26
10 31 30	159	32 ⁵
10 34	153	30
10 30 30	167	32 ⁶
10 47		
	Lobelina, four fifths of a drop.	
10 48 49	160	28
10 49 19	156	30
10 49 49	157	28
10 50 49	144	24
10 53 19	162	32
11 30	136	46

As was anticipated, the rise of pressure was unimportant.

Confirmatory of the above action of lobelina is that of the aqueous

¹ Hermann; *Lehrbuch der experimentellen Toxicologie*.

² Ludwig's *Arbeiten*, 1869.

³ *American Journal of the Medical Sciences*, cxxiii.

⁴ One minute and twenty-nine seconds after end of inhalation of amyl.

⁵ Amyl inhaled for thirty seconds.

⁶ Amyl inhaled for nineteen seconds.

extract of lobelia, prepared by Messrs. Tilden & Co., one grain of which equaled five and a half grains of lobelia. These experiments were made in Philadelphia, last summer.

Experiment VII.—Cat; crural artery; Fick's manometer; respiration recorded by Marey's polygraph; poison injected through jugular toward the heart.

Time.	Pulse.	Pressure.	Respiration.
	75 Aqueous extract of lobelia, .04 gramme.	123	
A. M. 9 25	73	133	36
9 25 30	83	133	48
9 26	85	136	33
9 27 30	90	139	21
9 34	92	130	17
9 42	112	86	12
9 43	107	116	14
9 56	105	130	29

Experiment VIII.—Dog; vagi and sympathetics cut; crural artery; Fick's manometer; artificial respiration.

Time.	Pulse.	Pressure.
	91 Aqueous extract of lobelia, sixteen grammes.	110
A. M. 10 25 30	89	103
10 26 30	114	113
10 27	124	103 Struggling.
10 28	114	70
10 28 30	114	70
10 29	101	63
	Vago-sympatheticus irritated.	
10 30	95	50
10 48	92	90
	Aqueous extract of lobelia, sixteen grammes.	
10 48 30	92	100 Struggling.
10 49	123	50
10 57	93	86 ¹

Reasoning from the above data, the inference would be that lobelina in small doses increases the blood pressure by acting as an excitant on the peripheral vaso-motor system. The pulse seems temporarily reduced and then increased; the necessarily limited number of our experiments precludes saying more about it. I will state here that I have found lobelia to be mainly a respiratory poison, and that in the cat it greatly reduces the temperature. The above experiments on lobelina were made in Professor Bowditch's Physiological Laboratory at Harvard Medical School; to him I am indebted for opportunities of study and many highly important suggestions in the investigation.

¹ The inhibitory power of vagus still remains.

